REMARKS

Responsive to the outstanding Office Action, applicant has carefully studied the Examiner's comments relative to formal matters. Favorable reconsideration of the application is respectfully requested.

The claims pending in the application are claims 23-44. In the amendment, applicant has amended claims 23-43 and added claim 44. Claim 44 contains only subject matter which was found in a previously pending claim. It is respectfully submitted that no new matter has been presented in this amendment.

Claims 23-27, 30, 31, 35, 36, 38, 39 and 42 were objected to by the examiner because of certain informalities, which the Examiner enumerated in the present Office Action. In response thereto, the claims have been amended to overcome the Examiner's objections.

Additionally, the Examiner rejected claims 23-43 under 35 USC §112, second paragraph. The Examiner made specific rejections against claims 23, 26, 27, 28, 29, 35, 36, 39, 41 and 42. In response thereto, these claims have been amended to correct the deficiencies noted by the Examiner. Please note that the Examiner questioned how three elements could be aligned in pairs. Please note that a first set of at least one is aligned in pairs with corresponding ones of a second set of at least one. It is believed that all of the claims now fully comply with the requirements of 35 USC §112, second paragraph.

Claim 43 was rejected under 35 USC §101 as claiming a use without indicating proper process steps. Claim 43 has been rewritten in a manner which makes it properly dependent from the independent structure claim. It is therefore believed that this rejection has been overcome.

The Examiner rejected claims 23-29, 31-37, 39-41 and 43 under 35 USC §103 as being unpatentable over Pederson et al. (U.S. Patent No. 5,319,975.) Claims 30, 38 and 42 were rejected under 35 USC §103 as being unpatentable over Pederson et al. in view of Wagner (U.S. Patent No. 5,001,054 and Bessman et al. (U.S. Patent No. 4,431,004).

Before discussing the prior art in detail, the Examiner's attention is directed to the present invention, as claimed in independent claim 23. The present invention is directed towards a

device for measuring fluorescence excited by light. The device has at least one layer applied to a support, the layer containing a fluorescing material. At least one light source emits light of at least one wavelength that excites fluorescence(s) in the at least one layer, and which light is directed through the support onto the at least one layer by at least one first optical conductor. The end faces of all the optical conductors are arranged relative to one another as a function of their numerical apertures and/or as a function of the at least one layer [(11, 32)] containing a fluorescing material.

Pederson et al. discloses a fiber optic moisture sensor, comprising a housing and a support within the housing, with a film coating the support. First and second light guides are positioned to communicate illumination to and from the film. A reflective surface, within the housing, faces the film. The film includes an optically transparent polymer and a salt complex of a metal ion and an organic compound. The salt is capable of absorbing moisture and emits a fluorescent signal when excited by light at the appropriate wavelength. The light is quenched as the coating complex absorbs moisture.

Wagner discloses a method for monitoring the glucose level in a body fluid. The method of Wagner utilizes an apparatus including a conjugate of glucose oxidase and a fluorescent dye coated onto an optical fiber. An excitation light source is used to trigger fluorescence emission which is registered by a fluorescence emission detector. The fluorescent dye detects oxygen quenching, as fluorescence emission increases in direct proportion to the glucose concentration in the fluid.

Bessman discloses a method and apparatus for detection of glucose in the body. The apparatus detects the absolute level of oxygen concentration in the fluid and corrects the output differential measurement indicative of the glucose level according to the absolute level of oxygen.

The independent claim (23) was rejected under Pedersen alone. It is important to note that the present invention requires that light be directed onto the at least one layer through the support. The layer, disposed on the support, contains the fluorescing material. The light directed

at this layer, through an optical conductor, excites fluorescence in the layer. This excited fluorescent light is directed through the second optical conductor(s). Nothing in Pedersen utilizes or suggests making the transmission a function of the numerical apertures of the end faces, as is done in claim 23. The present invention utilizes this function (and the arrangement of the end faces) to achieve a quick response, high measuring accuracy and defined overlapping of the numerical apertures.

This factor is important in that it is not possible to distribute the fluorescent material inside the polymer matrix in a perfectly homogeneous manner in the coating. Additionally, known fluorescent materials tend to decrease in effectiveness when exposed to light over time. The aging of these materials decreases their effectiveness, and interferes with their use as detectors. Typically, the fluorescence intensity will decrease after exposed to illumination for several hours. By directing the light through the optical conductor to the detector, it increases the sensitivity and thus allows for correction of errors caused by the above factors.

The attached figure (attachment 1) shows a schematic diagram illustrating numeric apertures of different optical conductors. Because of the arrangement of the conductors, special areas can be illuminated for fluorescence excitation and inspection, or for achieving a reference signal with at least a third optical conductor. Thus, it is possible to achieve a local assignment (distribution) of the measurable fluorescence intensity.

It is possible to utilize more than two optical conductors, arranged in varying forms, i.e. in a ring or in a row. The optical conductors for excitation and for the fluorescene light should be arranged in pairs opposing one another. Optional third optical conductors can be used in conjunction with the paired first and second optical conductors.

Wagner detects elevated glucose levels in a body fluid. Wagner does not require a fast response, as changes in glucose levels in body fluids, e.g. blood, is a relatively slow process. The optical fibers are arranged in a manner which does not take into account the numerical apertures, as is done in the present independent claim. The fluorescent intensity in Wagner must be measured and compared at at least two coated supports. Thus two different coatings must be

applied if the coatings are used on, for example, optical fibers. One of the coatings contains a conjugate, while the other contains an inactive enzyme for performing oxidation of glucose.

It should additionally be noted that the system of Bessman does not use an optical system, instead utilizing electrical electrodes. Therefore, it is submitted that the Bessman reference is not relevant to the present invention.

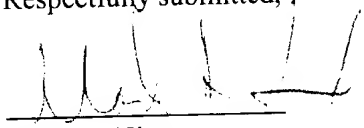
The Pedersen reference alone was applied against the independent claim, and as discussed above, it is submitted that this does not anticipate, nor render obvious, the present invention as claimed. However, even in conjunction with the remaining references, it is respectfully submitted that the present invention is not rendered obvious.

It is therefore submitted that the prior art references do not anticipate, nor render obvious, the present invention, utilizing paired optical conductors positioned as a function of the numerical apertures of the end faces of the optical conductors, to achieve a localized assignment of the measurable fluorescence intensity.

Claims 24-44, which depend directly or indirectly from an allowable claim 23, are believed to be allowable based, at least, upon this dependence.

Should the Examiner wish to modify the application in any way, applicant's attorney suggests a telephone interview in order to expedite the prosecution of the application.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

23. (amended) Device for measuring fluorescence excited by light, which has at least one layer [(11, 32)] which is applied to a support [(14, 30)] and which at least one layer contains a fluorescing material, having at least one light source [(2)] which emits light of at least one wavelength that excites fluorescence(s) and thus fluorescent light in the at least one layer [layer(s) (11, 32)], and which is light directed through the support [(14, 30)] onto the at least one layer [layer(s) (11)] by at least one first optical conductor [(3, 15, 16, 18)], the fluorescent light being directed by at least one second optical conductor [(15)] onto at least one detector [(4)] for determining the intensity of the fluorescent light, [characterized in that] wherein the end faces of all the optical conductors [(3, 15, 16, 20, 21, 22, 23)] are arranged relative to one another [, taking account] as a function of their numerical apertures and/or [with reference to] as a function of the at least one layer [(11, 32)] containing a fluorescing material and [being] which layer is applied to the support [(14, 30)], and the at least one second optical conductors [(20, 21, 22)] which are arranged as a bundle in the shape of a ring are arranged with [an] the at least one second optical conductor [(20, 22)], arranged in the interior of the ring, which bundle is used for exciting light or for generating fluorescent light, or a plurality of the at least one first optical conductors [(3, 15, 16)] are arranged in series arrangements opposite one another, with one of the first optical conductors and a corresponding one of the second optical conductors forming [in] pairs, such that it is possible to achieve a [local assignment] localized distribution of [the] measurable fluorescence intensity, and the light source(s) [(2)], the at least one first and the at least one second optical conductors [(3, 15, 16, 18, 20, 22, 31, 33)] and the detector(s) [(4, 5)] are held in a measuring head [(1)].

24. (amended) Device according to claim 23, wherein a part of the measuring head holds the outer ends of the optical conductors, and at least the part of the measuring head [(17)] which holds the outer end(s) of the optical conductors [(3, 15, 16, 18)] [is/are] is of flexible construction.

25. (amended) Device according to claim 23, wherein the [upper] measuring head has an upper region [(17)] which is at least partially bent.

26. (amended) Device according to claim 23, wherein [the] a filter [(7, 8)], a system of exchangeable filters and/or a launching optical system [(20)] is/are arranged in each case between the light source [(2)] and the at least one first optical conductor [(3, 18)] and/or between the detector [(4)] and the at least one first optical conductor [(15, 18)].

27. (amended) Device according to claim 23, wherein [a plurality of] the at least one second optical conductors [(20, 21, 22)] are arranged in the shape of a ring, a circular arc and/or a star on [the] an end of the measuring head [end (17)] pointing towards the at least one [fluorescing layer(s)] layer containing the fluorescing material.

28. (amended) Device according to claim 27, wherein the at least one second optical conductors [(20)] for the exciting light and the reference light [(21)] or a further fluorescent light are arranged in an alternating fashion in an outer ring, and at least one of the second optical conductors [(22)] for fluorescent light are arranged in an inner ring.

29. (amended) Device according to claim 23, wherein the at least one first and the at least one second optical conductors [(3, 15, 16, 20, 21, 22)] for exciting light, fluorescent light and reference light or a further fluorescent light are inclined at different angles with their ends pointing towards the fluorescing layer.

30. (amended) Device according to claim 23, wherein there is arranged on the upper measuring head region a heater [(12)] having a temperature sensor [(13)] and a controller or regulator which is arranged in the measuring head and maintains a prescribable temperature at the fluorescing layer(s) [(11)] and/or at [the] an upper region of the measuring head [region (17)].

31. (amended) Device according to claim 23, wherein the support [(30)], which is transparent to [the] exciting light and fluorescent light, has at least partially polished or reflecting surface regions [(36, 37)] and/or is surrounded there by a medium of lower refractive index, and is mounted in an exchangeable fashion on the measuring head [(1)].

32. (amended) Device according to claim 31, wherein the exciting light is launched into the support [(30)] with the aid of at least one optical conductor [(31)] such that the exciting light is totally reflected at least in the region of the layer [(32)], and damped total reflection occurs.

33. (amended) Device according to claim 31, wherein the support [(30)] is constructed in an elongated fashion in a plane.

34. (amended) Device according to claim 31, wherein the support [(30)] is subdivided along its longitudinal axis into a plurality of regions [(30.1, 30.2, 30.3)].

35. (amended) Device according to claim 31, wherein on [the] an end face opposite [its] an end face into which the exciting light can be launched, the support [(30)] has an angular surface and a layer of the at least one layer [(32)] which contains [a] the fluorescing material and at which the exciting and fluorescent light is reflected in the direction of a planar optical conductor [(35)] constructed symmetrically relative to the support [(30)], and the light from the angular surface thereof is directed onto an end face arranged at the other end of the optical conductor [(35)], and from there at least fluorescent light is directed onto a detector [(4)] via at least one optical conductor [(15)], the support [(30)] and planar optical conductor [(35)] being arranged at a spacing from one another and/or being optically separated as far as into the region of the angular surfaces.

36. (amended) Device according to claim 31, wherein the support [(30)] is of u-shaped construction comprising two limbs, the two limbs [(30', 30")] are arranged at least partially spaced apart and/or are optically separated from one another, and the exciting light can be launched into an end face of a limb [(30')] via at least one additional optical conductor [(31)], and at least fluorescent light can be coupled out via the end face of the other limb [(30")] into at least one further optical conductor [(33)].

37. (amended) Device according to claim 36, wherein the two limbs [(30', 30")] of the u-shaped support [(30)] are connected in the shape of a bow, a wedge or a cone, or by means of an angular web [(30"')].

38. (amended) Device according to claim 23, wherein heating elements [(12)] and/or temperature sensors [(13)] are integrated [or can be introduced] into the support [(30)].

39. (amended) Device according to claim 23, wherein between [an optical conductor] one of the optical conductors for fluorescence-exciting light and [a layer] one of the at least one layers [(32)] containing the fluorescing material, a transparent body [(40)] made from an optically scattering material is arranged, or a body is positioned, the body comprising a diffusely scattering surface [pointing to] facing the layer [(32)], which surface is constructed or arranged on the body [(40)].

40. (amended) Device according to claim 39, wherein the body [(40)] is formed from optically transparent material which contains light-scattering particles and/or is wavelength-selective.

41. (amended) Device according to claim 23, wherein at least one further optical conductor [(16)] directs [reflected] light onto a further detector [(5)] for detecting a reference signal.

42. (amended) Device according to claim 23, wherein [the] an upper heated region is thermally insulated with respect to [the] a lower region, in which lower region the light source(s) [(2)] and the detector(s) [(4, 5)] are held.

43. (amended) [Use of a device] Device according to claim 23, wherein said device is configured to detect [for detecting] fluorescence-quenching, fluid materials.